Claims

1. A method for recovering a volume of hydrocarbons from a hydrocarbon-containing reservoir in subterranean strata comprising

a process of locating the boundary of the hydrocarbon-containing reservoir comprising:

(a) deploying an electromagnetic transmitter;

(b) deploying an electromagnetic receiver;

(c) applying an electromagnetic (EM) field to the strata using the transmitter;

(d) detecting the EM wave field response using the receiver;

(e) analysing the response to determine the presence or absence of a hydrocarbon-containing reservoir;

(f) moving the receiver to another location along a path, whereby the path taken by the receiver in moving from location to location is being determined by the signal characteristics of previously detected EM wave field responses.; and

(g) repeating the steps c-e; and

producing the hydrocarbon volume from a well that penetrates the hydrocarbon-containing reservoir within the boundary derived from the process of locating the boundary of the hydrocarbon-containing reservoir.

2. The method of claim 1, wherein the transmitter and/or receiver is a dipole antenna.

3. The method of claim 1, wherein a component representing a refracted wave is sought in the wave field response, in order to indicate the presence of a hydrocarbon-containing reservoir.

4. The method of claim 1, wherein the field is transmitted for a period of time for 3 seconds to 60 minutes.

5. The method of claim 1, wherein the transmitter transmits the field as a constant signal.

6. The method of claim 1, wherein the receiver is arranged to follow a path in which the signal characteristics oscillates in value, thereby defining the boundary of the reservoir.

7. The method of claim 1, wherein the receiver is located on a land vehicle or a submarine vessel.

8. The method of claim 1, wherein the transmitter is deployed in a fixed location.

9. The method of claim 1, wherein the wavelength of the transmission is given by the formula

$$0.1s \qquad \lambda \leq 10s;$$

wherein λ is the wavelength of the transmission through the overburden and s is the distance from the seabed to the reservoir.

10. The method of claim 1, wherein the predetermined offset between the transmitter and a receiver is given by the formula:

$$0.5\,\lambda \leq L \leq 10\,\lambda;$$

where λ is the wavelength of the transmission through the overburden and L is the distance between the transmitter and the receiver.

11. The method of claim 1, wherein the transmission frequency is from 0.01 Hz to 1 kHz.

12. The method of claim 1, further comprising suppressing the direct wave and/or any other known wave contribution that may disturb the measurements, thereby reducing the required dynamic range of the receiver and increasing the resolution of the refracted wave.

13. The method of claim 1 wherein the hydrocarbon comprises oil.

14. The method of claim 1 wherein the hydrocarbon comprises natural gas.

15. A method of preparing a survey of a hydrocarbon-containing reservoir in subterranean strata comprising;

a process of locating a boundary of the hydrocarbon-containing reservoir comprising:

(a) deploying an electromagnetic transmitter;

(b) deploying an electromagnetic receiver;

(c) applying an electromagnetic (EM) field to the strata using the transmitter;

(d) detecting the EM wave field response using the receiver;

(e) analysing the response to determine the presence or absence of a hydrocarbon-containing reservoir;

(f) moving the receiver to another location along a path, whereby the path taken by the receiver in moving from location to location is being determined by the signal characteristics of previously detected EM wave field responses.; and

(g) repeating the steps c-e; and

preparing a map that comprises a depiction of at least a portion of the boundary of the hydrocarbon-containing reservoir as derived from the process of locating the boundary of the hydrocarbon-containing reservoir.

16. The method of claim 15, wherein the transmitter and/or receiver is a dipole antenna.

17. The method of claim 15, wherein a component representing a refracted wave is sought in the wave field response, in order to indicate the presence of a hydrocarbon-containing reservoir.

18. The method of claim 15, wherein the field is transmitted for a period of time for 3 seconds to 60 minutes.

19. The method of claim 15, wherein the transmitter transmits the field as a constant signal.

20. The method of claim 15, wherein the receiver is arranged to follow a path in which the signal characteristics oscillates in value, thereby defining the boundary of the reservoir.

21. The method of claim 15, wherein the receiver is located on a land vehicle or a submarine vessel.

22. The method of claim 15, wherein the transmitter is deployed in a fixed location.

23. The method of claim 15, wherein the wavelength of the transmission is given by the formula

$$0.1s \qquad \lambda \leq 10s;$$

wherein λ is the wavelength of the transmission through the overburden and s is the distance from the seabed to the reservoir.

24. The method of claim 15, wherein the predetermined offset between the transmitter and a receiver is given by the formula:

$$0.5\lambda \leq L \leq 10\lambda;$$

where λ is the wavelength of the transmission through the overburden and L is the distance between the transmitter and the receiver.

25. The method of claim 15, wherein the transmission frequency is from 0.01 Hz to 1 kHz.

26. The method of claim 15, further comprising suppressing the direct wave and/or any other known wave contribution that may disturb the measurements, thereby reducing the required dynamic range of the receiver and increasing the resolution of the refracted wave.

27. The method of claim 15 wherein the hydrocarbon comprises oil.

28. The method of claim 15 wherein the hydrocarbon comprises natural gas.